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DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
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GENERAL NOTE.

Owing to the current nature of the investigations mentioned in the Technical News Bulletin, sometimes it will be impossible to supply printed information regarding them. However, in these cases, when the investigation has progressed sufficiently far, the Bureau will be pleased to furnish technical data to those engaged in the particular application of the subject, in order to avoid the delay incident to publication.

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1 Colored Plasters

The investigation of colored plaster has been completed. It has been found possible to make colored wall plasters of any desired color or texture by use of dyed wood fiber in gypsum plaster. Panels of this material have been submitted to the Gypsum Industries Association in Chicago, and a publication on the subject is now being prepared.

2 Permeability of Concrete

Some preliminary tests have been made of a new apparatus for determining the rate of penetration of water through concrete and other permeable materials. The apparatus is so constructed that it is not necessary to mold the test piece in any particular shape, but any slab having one fairly smooth face may be tested. Only a few seconds are required for placing and adjusting the test specimen. This will permit specimens to be cut from walls or other portions of structures for tests. Tests so far made, while more in the nature of a try-out of the apparatus than the materials used, have furnished some rather interesting results.

In the following table the results of tests on samples of building stones from various quarries, as well as on some mortar and concrete specimens, are shown. The specimens varied from 1-1/4" to 2-1/2" in thickness and pressure was applied over an area of 25 square inches.

Test Specimen	Absorption in 24-hrs.	Thickness	Water Pressure	Time required for Penetration through wall
Limestone 50	5.80%	1-5/8"	60#	10-1/2 minutes
" 7E	3.10%	1-5/16"	do.	11 minutes
" 8907	4.40%	1-5/8"	do.	19 minutes
" 9c	4.60%	1-5/8"	do.	2-2/3 minutes
" 14F	3.81%	1-5/8"	do.	20 seconds
" 5G	3.48%	1-1/4"	do.	1-1/2 minutes
Sandstone	5.56%	2-1/2"	do.	10 seconds
1:6 Portland Cement Mortar	7.8%	2	do.	3-1/2 hours
1:1-1/2:2 Concrete	5.8%	2	do.	Did not fail in 24 hours when broken through water had penetrated only 1/2"

These results appear to bear out conclusions previously drawn in the Bureau's investigation of the durability of concrete in alkali soils that there is no apparent relation between absorption and permeability.

While considerable work must be done to standardize the method of making the permeability tests, it appears that this apparatus will assist in studying with a minimum of effort an important characteristic of concretes which has in the past been generally ignorned, due to lack of suitable apparatus.

3 Investigation of Combination of Aluminous and Siliceous Bond Clays Used in Making of Crucibles

During the war the making of glass pots, crucibles, and various other special refractories was seriously interfered with, owing to the lack of certain clays formerly imported from Germany, particularly plastic bond clay known as Gross Almerode. The Bureau conducted an investigation with the object of finding an American clay or combination of clays which could be used as a substitute for the German material. It was found that a mixture of three parts of Arkansas kaolin and one part of No. 4 Kentucky ball clay formed a satisfactory substitute for the Gross Almerode clay and this combination was used extensively during the war. This investigation is now being extended and will soon be completed. Sixty small pots have been made and will be subjected to the corrosive action of various kinds of glasses. It has been found that when used with 50% grog and Arkansas kaolin it has even a lower shrinkage and higher porosity than the German clay. These are very valuable properties for

clays to be used in the making of glass-house refractories, and present indications are that this clay will be extremely important for this particular purpose.

4 Fish Scaling of Sheet Steel Enamels

During the past month seven typical ground coat enamels have been made and applied to a large number of specimens. The relation of composition of ground coat, composition of steel, method of application of ground coat, heat treatment of the ground coat, composition of cover coats and of the heat treatment of the same to fish scaling are being studied. The relation of cold-working of the steel, such as is undergone by steel shapes, which are pressed into form before enameling, has been studied. It has been found in a number of cases that stretching the steel eliminated fish scaling which had occurred on unstretched steel of the same lot. These results confirm the observations made in practice that those parts of vessels which have been spun or stretched in shaping are often free from fish scaling in enamel, while the parts that have not been stretched contain fish scales.

5 Relation of Composition of Enamel to Solubility in Acids

During the progress of this investigation, it was noticed that in a large number of cases enamels scratched to some extent after being subjected to the action of boiling acid for only a few hours, but after continued treatment would not scratch at all. This led to the conclusion that possibly the boiling acid had some annealing effect upon the enameled surface that made it more resistant. This has been further investigated and it has been found that boiling enamels in oil for several hours before subjecting them to the acid treatment entirely eliminated this preliminary scratching and softening of the surface. Boiling in water had a similar but not as great an effect as boiling in oil, while simply heating the pieces in air had but very little effect. From the data thus obtained, it would seem advisable to treat with boiling oils all enameled wares which are to be subjected to the action of corrosive liquids.

6 National Electrical Safety Code

The new edition of the National Electrical Safety Code has gone to press. This code has been in the course of development for seven years. Preliminary drafts were circulated and criticized and the complete edition of the code was published in 1916 for trial use and constructive criticism. The new edition is expected to be made mandatory by state and city officials having appropriate jurisdiction. The rules of this code deal with the construction, installation, and operation of electrical machinery and devices. They apply to practice in generating stations, to outdoor lines used in transmission and distribution, and to the installations of equipment found in factories, offices, theatres, and other places where electrical energy may be applied.

7 The National Safety Code for the Protection of the Head and Eyes

The National Safety Code for the Protection of the Head and Eyes of Industrial Workers has also been sent to press. This is the first edition of this code to be printed, although in the two years during which these rules have been developed, mimeographed copies of several successive drafts have been circulated for criticism. The code specifies appropriate protectors in the form of goggles, helmets, hoods, etc., to protect workers in various occupations from mechanical hazards, such as flying particles, dust, and chemical fumes, and also from danger of injury to the eye due to the excessive light encountered in such operations as electric welding.

8 Method for the Accurate Measurement of the Interior Diameter of Ring Gages

A method for measuring the inside diameter of plain ring gages has been developed by the Bureau during the past month. The method is a very simple one and employs two steel balls the sum of whose diameters is slightly larger than the nominal inside diameter of the ring to be measured. The ring is laid on a surface plate and the larger ball placed in the ring, the smaller one then rests against the inside of the ring and on the larger ball. The difference in vertical position between the upper surfaces of the two balls is determined by means of a micrometer attachment. This dimension is

easily converted into the vertical distance between the centers of the two balls. The value thus obtained forms one side of a right-angle triangle whose hypotenuse is the line joining the centers of the two balls and whose base it is desired to determine. Knowing the vertical side and the hypotenuse, it is possible to calculate the length of the base, which added to the radii of the two balls gives the inside diameter of the ring. The method permits an accurate determination of the contact pressure and can be and has already been used on extremely small holes. A greater accuracy can be obtained by this method than by any other used up to this time.

9 Conference of Color Committee of Cotton Seed Oil Chemists

A conference dealing with the color standardization of oils was held at the Bureau of Standards on July 30 and 31. The entire subject was discussed in detail, including the use of technical terms, the present difficulty in getting instrument makers to turn out the required apparatus, and a demonstration of the methods used in color grading oils by the optical division of the Bureau. The new apparatus recently designed for this purpose was demonstrated and a great deal of time spent in familiarizing the committee with the use of the instrument. Data secured were compared with the results obtained from the Arons Chromoscope in terms of Lovibond numbers. Data were also secured on some of the samples by means of the Koenig-Martens Spectrophotometer.

10 Method for the Quantitative Measurement of Consistency

Some time ago the Bureau developed a method for the quantitative measurement of plasticity. This was described in Scientific Paper No. 278, and proved of great commercial value. Papers on the application of the method to paints have appeared in the Proceedings of the American Society for Testing Materials in 1919 and 1920.

The general method is to force the substance under investigation through a capillary tube by means of air pressure. The pressure is kept constant during any one run, but runs are made at various pressures with the same substance. The two values which are deduced from the readings thus obtained, determine the consistency, but do not determine the plasticity as

defined for mortars and plasters. In this latter sense, as described in Technologic Paper No. 169, plasticity depends upon other factors besides consistency.

At the present time an investigation is in progress at the Bureau in regard to the application of the plastometer, as used for paints, to adhesives such as starches and dextrines. This work is being done by an Industrial Associate under the general direction of a member of the Bureau's staff. The indications are that the quantitative measurement of the consistency of adhesives of definite concentration will do much to enable manufacturers to predict the exact behavior of their products in service.

11 The Use of Etched Balls in the Brinell Test of Hardened Steels

At the request of the Chairman of the Hardness Committee of the National Research Council, the device described by Hulgren for obtaining impressions with etched balls in the Brinell hardness test was examined in detail. Briefly this method of testing consists in etching the steel ball with which the impression is made for a minute or so in a weak (2%) alcoholic-nitric acid solution, after which the test is performed as usual. If the specimen, the hardness of which is to be determined, is in a polished state, the impressions with the etched balls are very distinct, while those with an unetched ball are almost invisible when viewed at certain angles. If the specimen to be tested is not polished, however, preliminary etching of the ball does not appear to be of much advantage.

12 Properties of Boiler Plate at Elevated Temperatures

Progress has been made in the microscopic examination of the fractured test bars made from boiler plate tested at various temperatures in the heated, cold and blue-rolled conditions. The work in connection with the study of the effect of rate of loading on the tensile properties of boiler plate at elevated temperatures has been completed. These properties are independent of the rate of loading where the pulling speed of the head of the testing machine is varied from the so-called "static method" (very slow loading) up to 1.6" per minute at temperatures up to and including 295°C.

13 Test of a Section of a Cast Iron Heating Boiler

At the request of the Superintendent of the State, War and Navy Building, the Bureau investigated thoroughly a section of cast iron heating boiler which had fractured in service. This section was one of several which had failed, all having been located similarly in the boiler. Chemical analyses, mechanical tests, and microscopic examination showed that the material, though somewhat inferior to the usual grade of gray cast iron, was not of so poor a quality as to account for the failure. This was undoubtedly due to other conditions, such as a poor setting of the boiler or faulty handling during operation.

Respectfully,

S. W. STRATTON

Director
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